VDL-7504
Video Delay Amplifier

VM-7504-02

Introduction

The VDL-7504 Video Delay Amplifier provides a convenient, compact and high-quality way to delay video signals so that system timing can be maintained. In addition to being used in video paths, this amplifier can be used to delay timing reference signals such as subcarrier or color black.

Frequency response over the whole delay range has been considerably improved by using active delay stages rather than passive delay lines.

Coarse delay is set with four jumper plugs. The total delay obtainable with the basic amplifier is 635 ns. Optional module VDM-7504 which attaches to the main amplifier board provides an additional 600 ns. Fine delay is continually adjustable over +/- 6 ns.

The differential input ensures excellent system performance by virtually eliminating common mode ground loop hum.

The cable equalizer will be very useful in many system situations as it compensates fully for the frequency response loss of up to 500 ft. (150 m) of associated Belden 8281 cable.

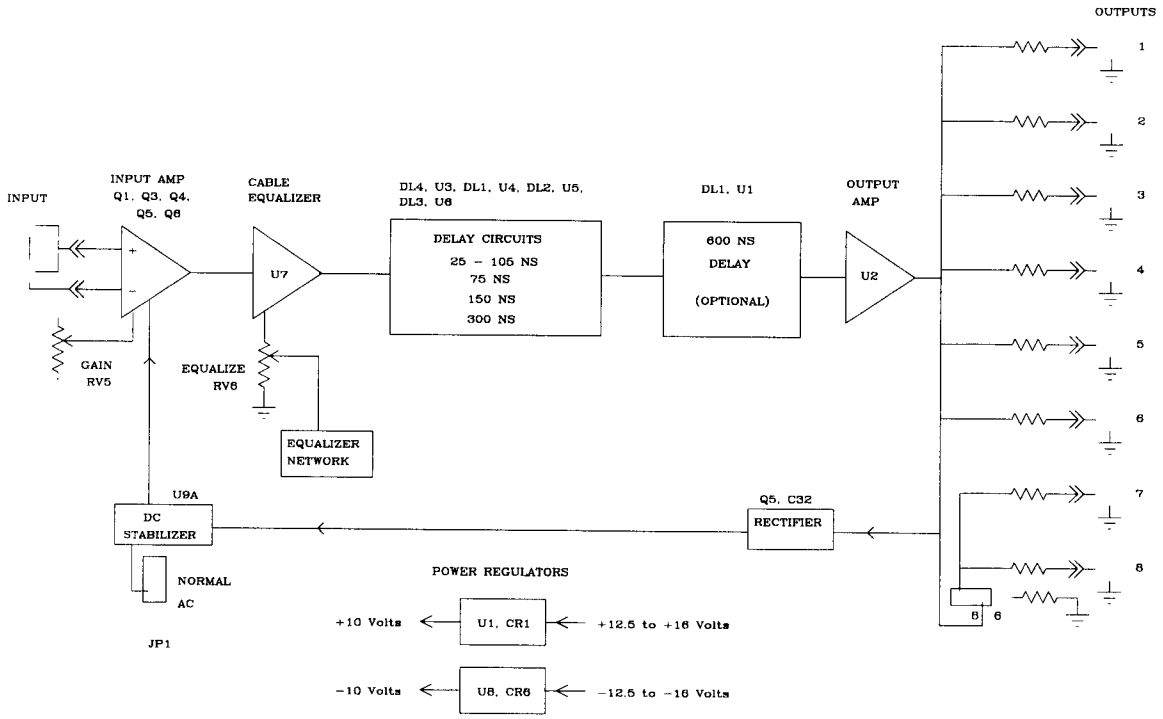
The amplifier occupies a single slot in a Ross VFR-7510 tray or GVG 8500/8800 series trays.

Features

- 8 Outputs
- Delay continuously adjustable from 30 to 635 ns
- Optional 600 ns module increases total delay to 1.24 us
- Differential Input eliminates ground loop hum
- Cable equalizer for 500 ft of 8281 cable
- Excellent performance
- Power to each card is individually fused
- Fits Ross or GVG* trays
- 5 year transferable warranty
- An alternative to the GVG* 8504 DA
- Also fits GVG* 8500/8800 Series Trays

*GVG is a trademark of Tektronix Inc.

VEA-7504
Block Diagram



Installation

> Note: Use of an extender board will make it easier to set the delay jumpers. This can be done with power on.

Do not disturb any adjustments other than those mentioned below. This equipment has been precisely factory-calibrated for the best frequency response and may not perform to specifications if any preset adjustments are disturbed.

1. Check the video gain and if necessary adjust the gain control RV5 located on the card front edge for flat sweep response or correct chroma level.

2.Check the frequency response. If necessary, adjust the cable equalizer RV6 located on the front card edge.

3. Check the position of the output jumper JP6

8	The normal position for all Ross and GVG 8-output trays
6	Use with GVG* 6-output trays

4. Check the setting of the coupling jumper JP5

NORM	The normal position for all signals having sync pulses
AC	Use this for component signals if they do not

5. Set the Delay 1 jumper to mid-position.

6. Set jumpers Delay 2 (75 ns), Delay 3 (150 ns) and Delay 4 (300 ns) to obtain as close as possible to the desired delay.

7. The 600 ns delay jumper should be set to the "0" position. If more delay is required, optional delay module VDM-7504 should be installed and the jumper set to the "600"position. It will provide an additional 600 ns of delay.

8. Set the final position of the Delay 1 jumper then adjust the Fine Delay control CV5 on the card edge to precisely set the delay. It may be necessary to re-select some of the previous jumper settings.

Circuit Description

Please refer to the schematic, sheet 1.

The incoming video is amplifier by a differential amplifier consisting of Q1, Q2, Q3, Q5 and Q6. The output appears at Q1 emitter.

Cable equalizer U1 inverts to video and provides equalization for up to 500 ft of 8281 cable. It also drives the delay circuits, to be described later.

The delayed video passes to output stage U2, which inverts the video and provides power to drive the 8 outputs. This stage also includes the fine delay control CV5.

DC stabilization of the output signal is accomplished by U9A and Q5. Q54 rectifies the sync tip level to provide a correction voltage. In the NORM position of the jumper, this voltage is amplified by U9A and fed to Q6 to correct the input signal. By keeping the output sync tip correctly biased, the back porch will be maintained approximately at ground level. The jumper AC position is used with signals that do not have sync such as analog component waveforms.

U1 and U6 filter and regulate the DC power.

Please refer to the schematic, sheet 2.

All delay circuits located on the main circuit board are covered by this page of the schematic.

The signal from U7 pin 6 is fed to tapped delay line DL4. JP8 and JP7 allow the signal to be delayed in 8ns steps to a total delay of 80ns. Because this is in addition to the basic amplifier delay, the range covered is approximately 25 to 105 ns. The output is amplified by U3.

DL1 provides a delay of 75ns, the output being amplified and response corrected by U4. Similar delay stages involving DL2, U5, DL3 and U6 add delays of 150ns and 300ns respectively. Each delay stage is calibrated for flat frequency response and unity gain.

For the optional 600 ns Video Delay Module, please refer to schematic VDM-7504, sheet 1. This schematic diagram covers the circuit which is identical to that of the above 75, 150 and 300ns delay stages.

Alignment

IMPORTANT: All amplifiers have been very accurately calibrated at the Ross factory. Alignment should only be attempted if absolutely necessary and the required precision sweep measuring equipment is available.

1. INITIAL AMPLIFIER SETTINGS

Put the amplifier on an extender board and set the amplifier controls as follows:

JP1-JP4 - in 0 position.
JP5 - NORM
JP6 - in 8 position (6 if in GVG* 6 output tray)
JP7 - NOT INSTALLED
JP8 - in 0 position.

Rotate RV6 EQUALIZE fully counter clockwise.

2. GAIN CALIBRATION

Set up a method of accurately measuring amplifier gain, using a window or pulse & bar signal. Set equalization control (RV6) to minimum. Adjust the GAIN control (RV5) to obtain unity gain.

3. FREQUENCY RESPONSE, 0 Delay

Connect a sweep signal to the amplifier input. Adjust CV4 and RV1 for a response up to 6 MHz of +/- 0.15 dB. Rotate CV5 fully. The frequency response should not go out of spec (+/-0.15 dB to 6 MHz at any point of CV5's rotation. If the frequency does not meet spec, adjust CV4 and RV1 and repeat this step until the frequency response spec is met. Adjust the fine delay (CV5) on the DA and the phase knob on the vector scope to centre the vector dot on the horizontal axis (same amount of travel both up and down). You must have 8 degrees of adjustment both up and down on the vectorscope.

4. FREQUENCY RESPONSE, 8 - 80ns of Delay

Move the JP8 "DELAY 1" jumper to the "8" position and adjust RV7 and CV7 to obtain the flattest response, ensuring that the it falls within the response limits of up to 6 MHz of +/- 0.15 dB.

Note: The over all gain will vary as you select different delay taps on the delay line. You can adjust the GAIN control RV5 to centre the trace when checking for response. Select in turn the remaining nine DELAY 1 jumper positions and ensure that for each of the positions the response remains within the limits described above.

Note: it maybe necessary to re-adjust CV4 and RV1 "0" response so that all of the tap positions fall in to the described limits. If so, repeat steps 3 and 4.

Return the jumper to the 0 position and adjust the gain control RV5 to centre the trace.

GVG* is a trademark of Tektronix Inc.

5. FREQUENCY RESPONSE, 75ns of DELAY

Move Delay 2 to the "75ns" position and adjust RV5 (Gain), CV1 and RV2 to achieve a response up to 6 MHz of +/- 0.15 dB. Return DELAY 2 to the 0 position.

6. FREQUENCY RESPONSE, 150ns of DELAY

Move DELAY 3 to the "150ns" position and adjust RV5 (Gain), CV2 and RV3 to achieve a response up to 6 MHz of +/- 0.15 dB. Return DELAY 3 to the 0 position.

7. FREQUENCY RESPONSE, 300ns of DELAY

Move DELAY 4 to the "300ns" position and adjust RV5 (Gain), CV3 and RV4 to achieve a response up to 6 MHz of +/- 0.15 dB. Return DELAY 4 to the 0 position.

8. FREQUENCY RESPONSE, Optional 600 ns of DELAY

Move the 600ns DELAY jumper (JP4) to the 600 ns position, and adjust RV4 (GAIN) on the VDL-7504 and CV1 on the VDM-7504 to achieve a response of +/- 0.15 dB up to 6 MHz.

9. COMBINATION DELAYS:

Move DELAY 1 to "75ns" and DELAY 2 to "150ns". Check that the frequency response meets spec. If it does not, adjust CV1, RV2, CV2, RV3 as needed and repeat steps 5 and 6.

Next, move DELAY 4 to "300ns" (DELAY 2 in "75ns" and DELAY 3 in "150ns"). Check that the frequency response meets spec. If not, adjust CV3, RV4, CV2, RV3, CV1, RV2 as needed and repeat steps 5, 6, 7 and COMBINATION DELAYS section.

Next, move DELAY 3 to "0" (DELAY 2 in "75ns" and DELAY 4 in "300ns"). Check that the frequency response meets spec. If not, adjust CV3, RV4, CV1, RV2 as needed and repeat steps 5, 7, and COMBINATION DELAYS section.

Next, move DELAY 2 to "0" (DELAY 3 in "150ns" and DELAY 4 in "300ns"). Check that the frequency response meets spec. If not, adjust CV2, RV3, CV3, RV4 as needed and repeat steps 6, 7 and COMBINATION DELAYS section.

Return DELAY 2, DELAY 3, and DELAY 4 to their "0" positions.

10. EQUALIZER CALIBRATION - 500 Ft

Connect 500 ft of 8281 or equivalent cable in series with the sweep signal to the amplifier input. Adjust the EQUALIZE control (RV4) to maximum and set CV6 for flattest response to 8 MHz. You may have to back off RV6 a little bit to get the 500 Ft. response to match the 0 feet response. Rotate the EQUALIZE control fully counter clockwise. This completes the response alignment. Seal RV1, RV2, RV3, RV4, RV7.

Specifications

Input		Performance	
Video Input Level	1 V pp	Gain range	+3 dB to -3 dB
Input Impedence	75 Ω bridging	Gain stability	<0.1% per 10°C
Input Return Loss	46 dB to 5 MHz (41 dB GVG* Tray)	Frequency response	± 0.15 dB to 6 MHz
Max DC on input	+V, -15V	Line rate window tilt	< 0.2%
Max Common mode signal	10 V pp	Field rate window tilt	< 0.2%
Common mode rejection	60 dB at 50/60 Hz	50/60 Hz square wave tilt	< 0.1%
Output		Bounce (black to white)	< 0.5%
Number of outputs	8 (6 jumper selectable)	Differential gain (10%-90% APL)	< 0.35%
Output impedance	75Ω	Differential phase (10%-90% APL) all outputs loaded	< 0.35°
Ouput return loss	40 dB to 5MHz	RMS noise 0-5 MHz (unweighted)	66 dB
Output isolation	38 dB to 5MHz	Chrominance/luminance delay	< 2.0 ns
D.C. Offset	<50 mV	K rating 1T	0.3%
Output loading per termination at 6 MHz	0.01 dB	Electrical Length	26 ns (34.0 degrees at 3.58 MHz) (42.0 degrees at 4.43 MHz)
Equalization			
Cable accuracy 0 to 500 feet	±0.04 dB to 6 MHz (8281 cable)		
Delay			
Total Range	Continuously variable 30 to 635 ns		
Fine Control Range	+/- 6 ns		
Optional Module Delay	600 ns additional delaly from module VDM-7504		

Specifications and designs are subject to change without notice.

Ordering Information

VDL-7504	Video Delay Amplifier
VDM-7504	Video Delay Module (600 ns)
VFR-7510	Video Tray 2 RUs, holds 10 amplifiers
PS-7103	Power Supply (85 - 250 volts)
EXT-7511	Extender Board

Note: The video tray does not include power suppplies. The tray requires one or two supplies, the second supply for redundancy.

The Ross Video tray will accept any GVG* compatible card.

GVG* is a trademark of Tektronix Inc.

VEA-7504
Bill Of Materials

7504001-.02A

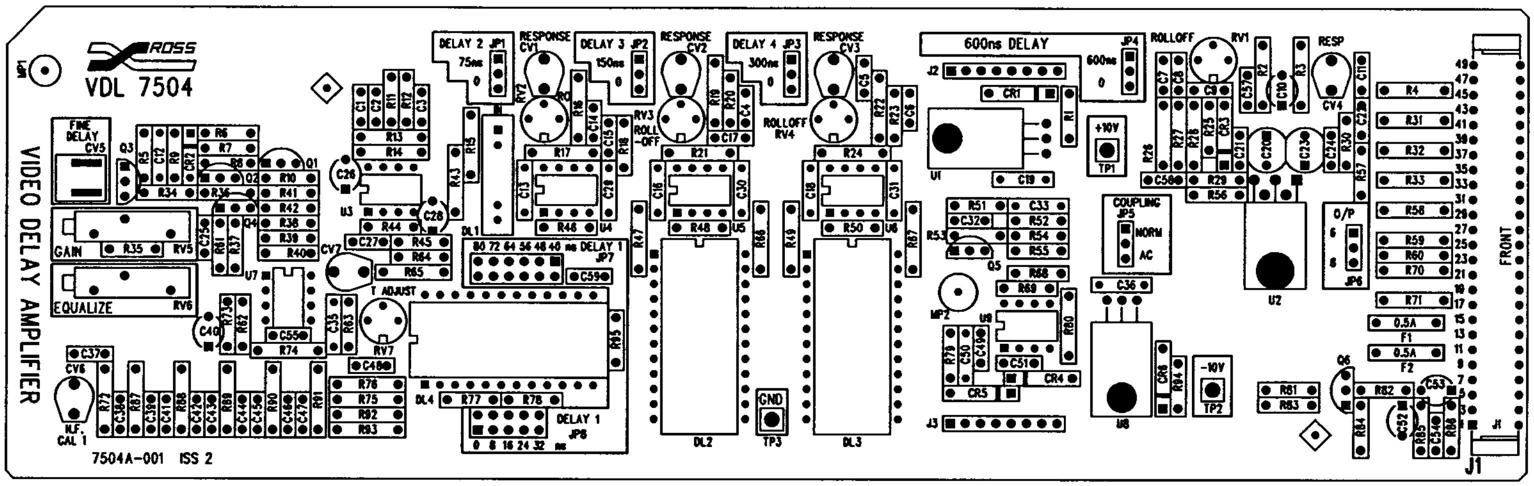
Item	QTY	Description		Part #	REF
1	14	NO VALUE,CAP,DCAP\SR21		-------	C3,C4,C6,C8,C11,C15,C22, C25,C37,C38,C39,C42,C44, C59
2	5	NO VALUE,RES,5%		-------	R18,R20,R23,R55,R57
3	2	NO VALUE,TEST POINT		-------	TP2,TP1
4	1	CAP,CER,100V,0.25PF,1p8		200-180	C55
5	1	CAP,CER,100V,0.25PF,2p7		200-270	C17
6	1	CAP,CER,100V,0.25PF,3p3		200-330	C46
7	1	CAP,CER,100V,0.25PF,4p7		200-470	C41
8	1	CAP,CER,100V,0.25PF,6p8		200-680	C2
9	2	CAP,CER,100V,2%,10p		201-100	C43,C57
10	3	CAP,CER,100V,2%,15p		201-150	C14,C27,C45
11	1	CAP,CER,100V,2%,18p		201-180	C5
12	1	CAP,CER,100V,2%,27p		201-270	C47
13	1	CAP,CER,100V,2%,33p		201-330	C9
14	1	CAP,CER,100V,2%,39p		201-390	C48
15	1	CAP,CER,100V,2%,82p		201-820	C58
16	1	CAP,CER,100V,2%,n15		202-150	C7
17	1	CAP,CER,100V,2%,n47		202-470	C49
18	1	CAP,CER,2n2		203-220	C1
19	2	CAP,CER,10n		204-100	C32,C54
20	3	CAP,CER,50V,20%,1u0		206-100	C21,C24,C51
21	12	CAP,GLAS,100n		225-100	C12,C13,C16,C18,C19,C29, C30,C31,C33,C35,C36,C50
22	3	CAP,TANT,4u7		250-007	C26,C28,C40
23	3	CAP,TANT,10V,100u		250-010	C10,C52,C53
24	2	CAP,ALUM,16V,22u		250-011	C23,C20
25	6	CAP,TRIM,6p5-40p		270-005	CV1,CV2,CV3,CV4,CV6,CV7
26	1	CAP,TRIM,4-20p		270-007	CV5
27	1	CONN,2X25P,PCB MNT,RECEPTACLE,90DEG		311-035	J1
28	1	DL,150ns,2211-150B,24P,DIP,0.6		352-051	DL2
29	1	DL,80ns,2214-80A,24P,DIP,0.6		352-052	DL4
30	1	DL,300ns,100R,FIX		352-053	DL3
31	1	DL,75ns,1514-75Y,7P,SIP,0.6		352-054	DL1
32	1	DIODE,SIGNAL,GP		360-005	CR2
33	5	DIODE,ZENER		360-012	CR1,CR3,CR4,CR5,CR6
34	1	EJECTOR,PCB		365-003	MP1
35	1	HDR,10P,2 ROW,PL.23,BL.1,LL.1,M		403-004-10	JP8
36	1	HDR,12P,2 ROW,PL.23,BL.1,LL.1,M		403-004-12	JP7
37	6	HDR,3P,1 ROW,PL.23,BL.1,LL.1,M		403-013-03	JP1,JP2,JP3,JP4,JP5,JP6
38	2	HDR,8P,1 ROW,PL.23,BL.1,LL.1,M		403-013-08	J2,J3
39	1	REGULATOR,POSITIVE VOLTAGE	THL	500-015	U1
40	1	REGULATOR,NEG,VOLTAGE	THL	500-020	U8
41	1	OP-AMP,DUAL,JFET-I/P	THL	500-075	U9
42	1	AMP,120MHz,CURRENT FEEDBACK	THL	500-102	U7
43	1	AMP,70MHz,1A,VIDEO	THL	504-097	U2
44	4	AMP,VIDEO,100MHz,TEMP/STAB	THL	504-100	U3,U4,U5,U6
45	7	JUMPER,2-POS,LOW PROFILE		603-005	JPP1,JPPLUG2,JPPLUG3, JPPLUG4,JPPLUG5,JPPLUG6, JPPLUG8
46	3	NUT,HEX		650-012	NUTU1,NUTU4,NUTU5
47	1	TRIMPOT,1/4 DIA,1T,50R		710-001	RV7
48	1	TRIMPOT,1/4 DIA,1T,500R		710-004	RV1
49	1	TRIMPOT,1/4 DIA,1T,1K		710-005	RV4
50	2	TRIMPOT,1/4 DIA,1T,5K		710-007	RV3,RV2
51	2	TRIMPOT,20T,1K		720-001	RV5,RV6
52	1	VIDEO DELAY AMP ----------	PCB	7504-001-02	PCB1

53	1	RES,1/4W,5%,10M	807-100	R80
54	2	RES,1/4W,1%,1R	810-100	F1,F2
55	1	RES,1/4W,1%,24R9	811-249	R65
56	1	RES,1/4W,1%,49R9	811-499	R76
57	1	RES,1/4W,1%,90R9	811-909	R92
58	6	RES,1/4W,1%,100R	812-100	R27,R47,R49,R66,R67,R75
59	2	RES,1/4W,1%,150R	812-150	R28,R26
60	1	RES,1/4W,1%,237R	812-237	R3
61	2	RES,1/4W,1%,294R	812-294	R13,R22
62	1	RES,1/4W,1%,309R	812-309	R72
63	1	RES,1/4W,1%,324R	812-324	R16
64	3	RES,1/4W,1%,332R	812-332	R14,R17,R24
65	1	RES,1/4W,1%,604R	812-604	R93
66	1	RES,1/4W,1%,750R	812-750	R74
67	2	RES,1/4W,1%,1K	813-100	R19,R21
68	1	RES,1/4W,1%,1K07	813-107	R2
69	1	RES,1/4W,1%,4K75	813-475	R87
70	1	RES,1/4W,1%,7K5	813-750	R88
71	1	RES,1/4W,1%,16K5	814-165	R89
72	1	RES,1/4W,1%,27K4	814-274	R91
73	1	RES,1/4W,1%,39K	814-390	R90
74	1	RES,1/2W,5%,4R7	824-470	R30
75	1	RES,1/2W,5%,10R	825-100	R84
76	1	RES,1/2W,5%,15R	825-150	R86
77	1	RES,1/2W,5%,22R	825-220	R29
78	1	RES,1/2W,5%,47R	825-470	R62
79	4	RES,1/2W,5%,100R	826-100	R5,R8,R56,R96
80	11	RES,1/2W,5%,150R	826-150	R7,R12,R34,R44,R45,R46, R48,R50,R64,R69,R73
81	2	RES,1/2W,5%,220R	826-220	R78,R82
82	1	RES,1/2W,5%,270R	826-270	R37
83	1	RES,1/2W,5%,330R	826-330	R77
84	1	RES,1/2W,5%,390R	826-390	R61
85	2	RES,1/2W,5%,620R	826-620	R25,R6
86	1	RES,1/2W,5%,1K	827-100	R35
87	1	RES,1/2W,5%,1K2	827-120	R41
88	2	RES,1/2W,5%,1K5	827-150	R63,R10
89	2	RES,1/2W,5%,1K8	827-180	R95,R42
90	1	RES,1/2W,5%,3K3	827-330	R54
91	1	RES,1/2W,5%,7K5	827-750	R9
92	1	RES,1/2W,5%,9K1	827-910	R38
93	3	RES,1/2W,5%,10K	828-100	R1,R39,R94
94	1	RES,1/2W,5%,18K	828-180	R40
95	1	RES,1/2W,5%,20K	828-200	R11
96	1	RES,1/2W,5%,22K	828-220	R83
97	1	RES,1/2W,5%,47K	828-470	R81
98	1	RES,1/2W,5%,51K	828-510	R52
99	1	RES,1/2W,5%,150K	829-150	R36
100	1	RES,1/2W,5%,470K	829-470	R51
101	4	RES,1/2W,5%,1M	830-100	R53,R68,R79,R85
102	11	RES,1/4W,0.5%,75R	840-004	R4,R15,R31,R32,R33,R43, R58,R59,R60,R70,R71
103	3	SCREW,4-40,1/4,BIND,PHILIPS	850-040	SCRWU1,SCRWU4,SCRWU5
104	1	TEST POINT	910-010	TP3
105	5	TRANSISTOR,N-P-N	950-016	Q1,Q2,Q3,Q4,Q6
106	1	TRANSISTOR,P-N-P	950-018	Q5
107	3	WASHER,SPRING,4-40	960-015	WSHRU1,WSHRU4,WSHRU5

Notes

SQUARE PIN DESIGNATIONS:
INTEGRATED CIRCUIT = PIN 1
TRANSISTOR = EMITTER
DIODE = CATHODE (BAR)
POLARIZED CAPACITOR = POSITIVE PIN (+)
RESISTOR NETWORK = PIN 1

NV = NO VALUE COMPONENT (INSTALLED BY TEST)
LED = POSITIVE PIN (LONG LEG)



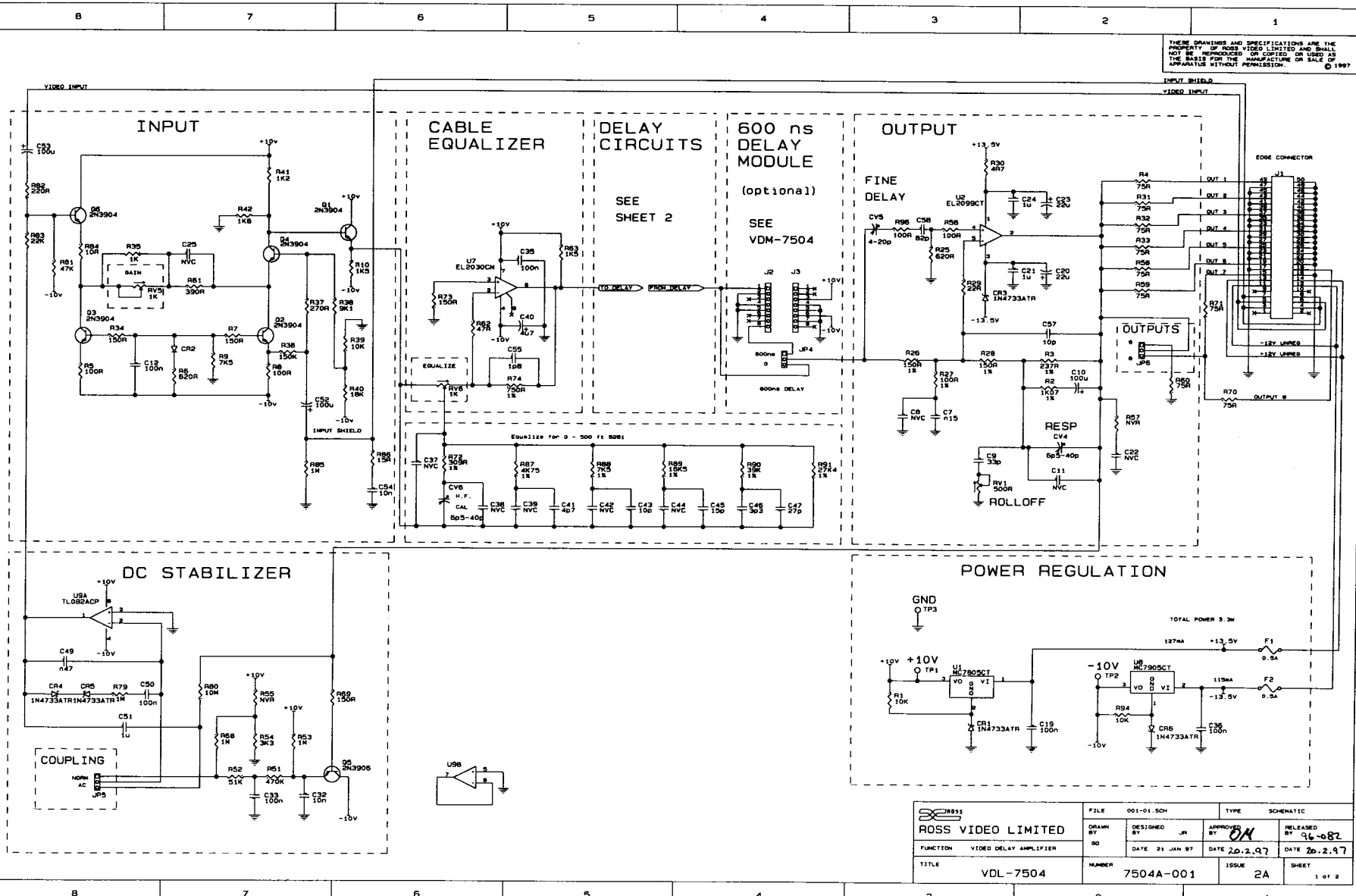
CV1 = DELAY 2 RESPONSE
CV2 = DELAY 3 RESPONSE
CV3 = DELAY 4 RESPONSE
CV4 = RESPONSE
CV5 = FINE DELAY
CV6 = HIGH FREQUENCY CALIBRATE

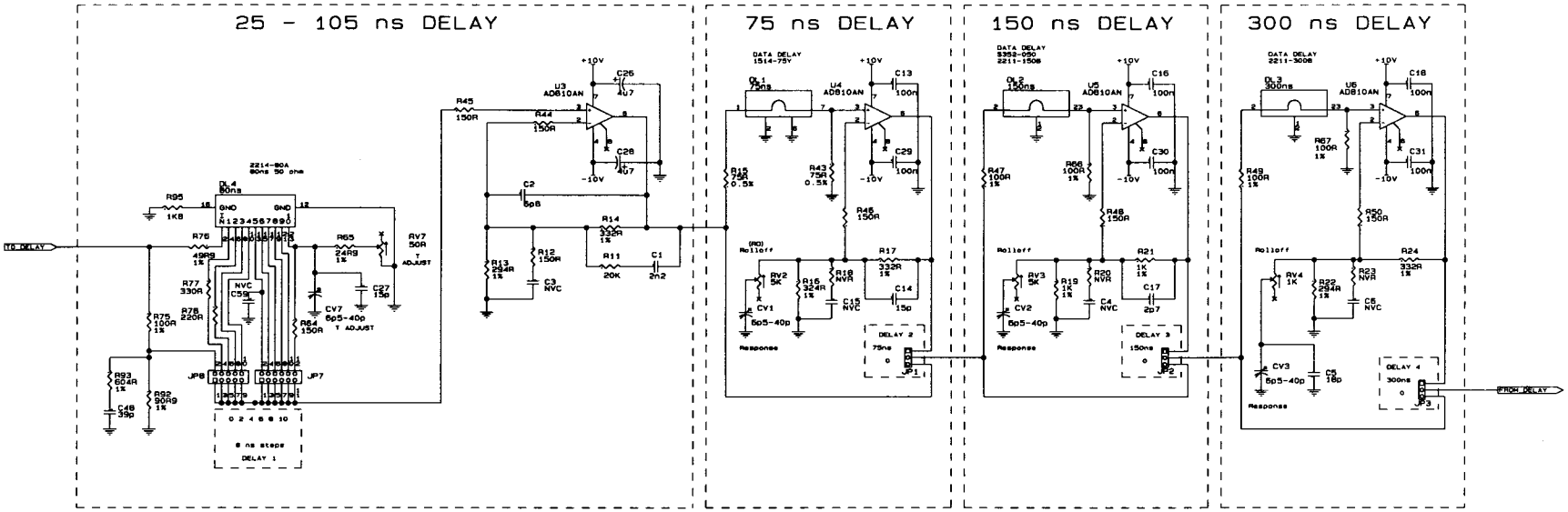
JP1 = DELAY 2 75ns/0
JP2 = DELAY 3 150ns/0
JP3 = DELAY 4 300ns/0
JP4 = 600ns DELAY 600ns/0
JP5 = COUPLING NORMAL/AC
JP6 = OUTPUTS 6/8
JP7 = DELAY 1 40ns - 80ns
JP8 = DELAY 1 0ns - 32ns

RV1 = ROLLOFF
RV2 = DELAY 2 ROLLOFF
RV3 = DELAY 3 ROLLOFF
RV4 = DELAY 4 ROLLOFF
RV5 = GAIN
RV6 = EQUALIZE

TP1 = +10V
TP2 = -10V
TP3 = GND

ROSS VIDEO LIMITED	FILE		TYPE LAYOUT	
	DRAWN BY	DESIGNED BY J R	APPROVED BY	RELEASED BY 96-055
FUNCTION		DATE 28 Aug 96	DATE 28.8.96	DATE 28.8.96
TITLE VDL-7504	NUMBER 7504A-001		ISSUE 02	SHEET 1 of 1





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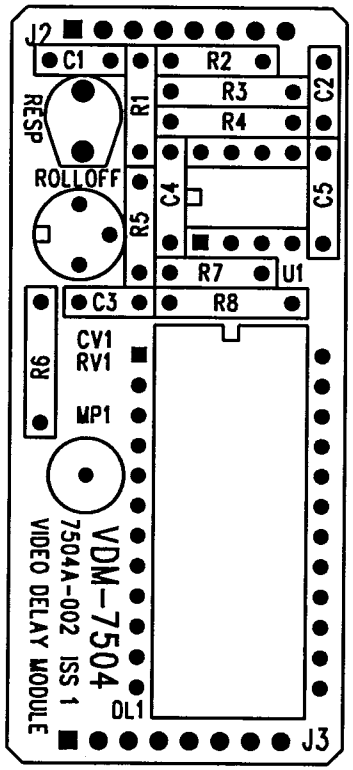
FUNCTION VIDEO DELAY AMPLIFIER		DATE 21 JAN 97	DATE 20.2.97	DATE 20.2.97
TITLE VDL-7504	NUMBER 7504A-001		ISSUE 2A	SHEET 2 of 2

REVISION RECORD

ISSUE	REV BY	DCO	APP BY	DATE



SQUARE PIN DESIGNATIONS:
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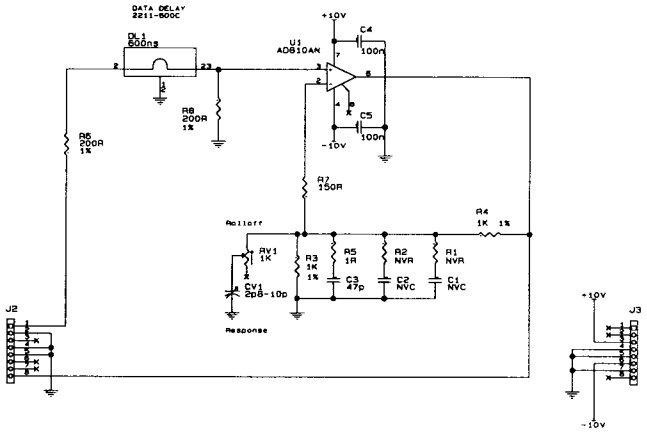
DIODE = CATHODE (BAR)
POLARIZED CAPACITOR = POSITIVE PIN (+)
RESISTOR NETWORK = PIN 1

NV = NO VALUE COMPONENT (INSTALLED BY TEST)
LED = POSITIVE PIN (LONG LEG)

CV1 - RESPONSE
RV1 - ROLLOFF

ROSS VIDEO LIMITED	FILE LA7504-2.SCH	TYPE LAYOUT	
FUNCTION VIDEO DELAY MODULE	DRAWN BY B W R	DESIGNED BY J.E DATE 28 Aug 96	APPROVED BY DM DATE 6.9.96
TITLE VDM-7504	NUMBER 7504A-002	ISSUE 01	RELEASED BY PE DATE 6.9.96
			SHEET 1 of 1

600 ns DELAY



ROSS VIDEO LIMITED	FILE 001-02.SCH	TYPE SCHEMATIC	
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	DATE 28 Aug 96	DATE 6.9.96	RELEASED BY DR.Ab
TITLE VDM-7504	NUMBER 7504A-002	ISSUE 01	DATE 6.9.96
			SHEET 1 OF 1

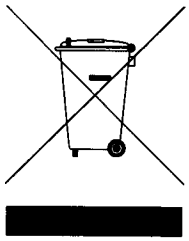
Cool Practical Technology™

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

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DISTRIBUTION PRODUCTS
WARRANTY and REPAIR POLICY

1. Ross Video Limited (the Company) warrants its products to be free from defects in workmanship and material under normal use and service for a period of **FIVE** years from the date of shipment. If, within the warranty period, the customer notifies the Company that a product is defective, the Company will correct the defect, either by repairing the defective product or if not repairable, by shipping a replacement product to the customer, as determined by the Company.

2. Liabilities under this warranty is limited to the repair or replacement of the product as determined by the company and is in lieu of all other warranties expressed or implied.

3. This warranty does not extend to any product which has been subjected to misuse, neglect, accident, improper installation or application, nor does it extend to products which have been repaired or altered outside the factory by personnel other than those of the Company, unless expressly authorised in writing by the Company.

4. Warranty repairs will be made at the Company's plant unless otherwise specified in writing by the Company. All packing, shipping, and special handling costs will be paid for by the customer.

5. Non-warranty repair service made at the factory will be at customer expense. Cost of repairs will be quoted following examination of the product by Company personnel.

6. In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits).